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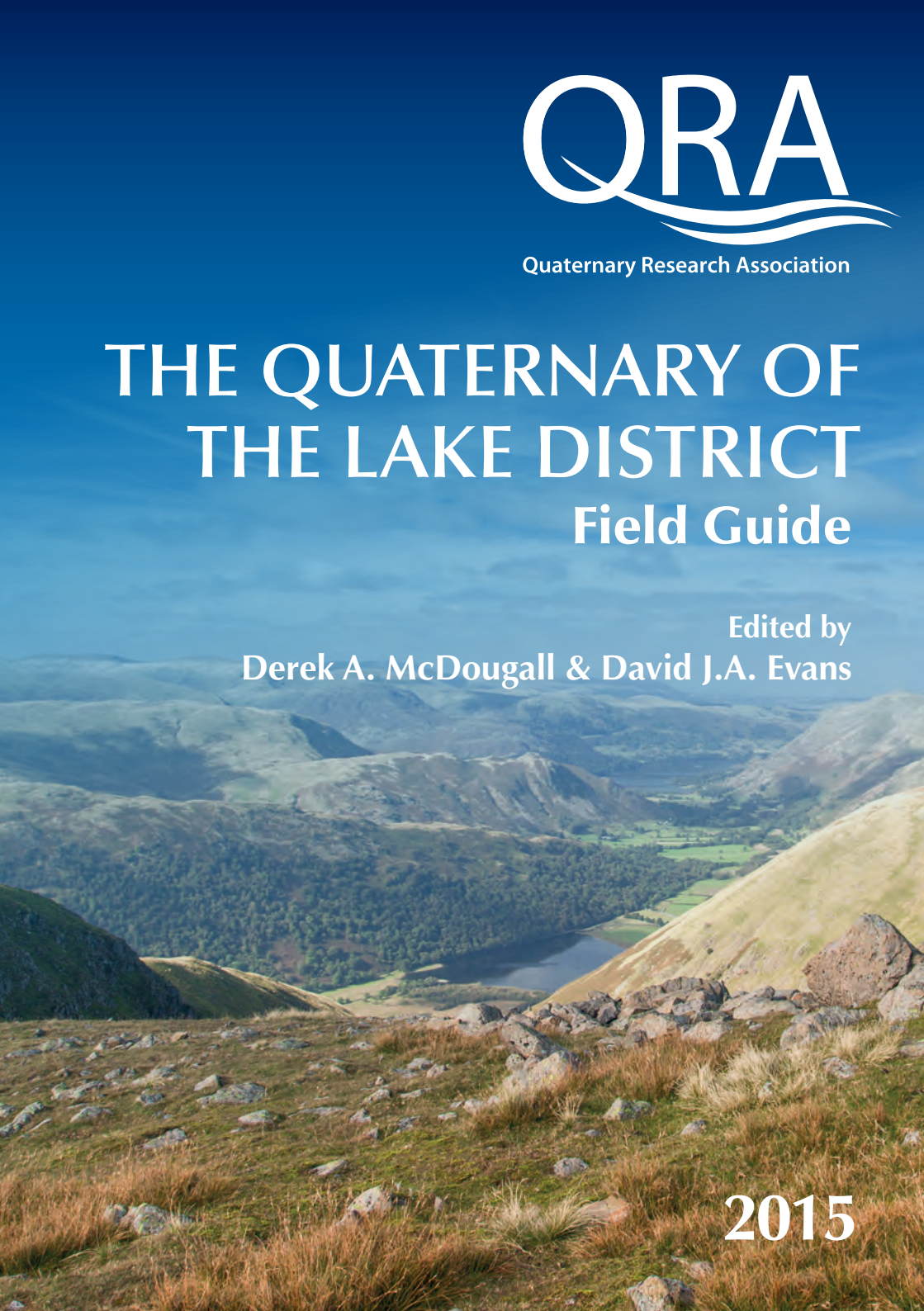
Quaternary Research Association

THE QUATERNARY OF THE LAKE DISTRICT

Field Guide

Edited by
Derek A. McDougall & David J.A. Evans



2015

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Cover Photograph: Stony Cove Pike, looking towards Brothers Water and Ullswater (D. McDougall).

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Preface

It may be tempting to assume that the Quaternary history of the English Lake District, a popular venue for school and university field trips, is well established. This is far from being the case, unfortunately, despite a long history of research (e.g. Marr, 1916; Manley, 1959; Pennington, 1976; Sissons, 1980) and many advances in our understanding since the QRA last held its Annual Field Meeting in the Lake District in 1994 (see Boardman and Walden, 1994). This field guide reviews some recently-published work and reports on ongoing investigations in the area, as well as identifying topics and areas for further research.

Themes and issues addressed in the field guide include:

- **Rock slope failures (RSFs).** Recent work (e.g. Wilson et al., 2004; Davies et al., 2013) demonstrates that these are far more common in the Lake District than previously thought. In some cases, their deposits have been misinterpreted as rock glaciers and moraines; this is clearly problematical where these have formed the basis of palaeoenvironmental reconstructions. RSFs have also influenced long-term landscape evolution, at least locally, in a range of ways, such as trough widening and cirque enlargement. As outlined in the field guide, however, RSFs are not always straightforward to recognise in the landscape, and many questions about timing and processes remain (see chapters 5, 8-11, 13, 14).

- **Younger Dryas (Loch Lomond Stadial) glaciation style and extent.** It is now recognised that in many parts of the Lake District this glaciation was characterized by extensive summit icefields and outlet glaciers rather than the 'textbook' cirque and valley glaciers reconstructed by Sissons (1980). This reinterpretation is consistent with our understanding of contemporary glacial environments, removes the need to invoke significant local variations in snowfall (for example) to account for anomalously located glaciers, and results in more realistic palaeoenvironmental reconstructions (e.g. Rea et al., 1998; McDougall, 2001; Brown et al, 2013). Unfortunately, the latter has not been fully realized due to ongoing uncertainties about outlet glacier extents, which reflect the highly variable nature of the geomorphological record within and between valleys and associated dating uncertainties (McDougall, 2013). In some cases, for example, interactions between glaciers and topography limited the supply of extraglacial debris to former ice margins, which in turn resulted in subdued, low relief moraines rather than the 'fresh', prominent moraines classically associated with the Younger Dryas. As it becomes increasingly clear that the geomorphological record is complex and incomplete, it seems likely that the

approach of Brown et al. (2013) – who used numerical modelling as a means of assessing empirically-based reconstructions – will be employed more widely.

- **Pre-Younger Dryas glaciation.** With the exception of the study of cirque evolution (e.g. Evans and Cox, 1995), very little research has been undertaken on glaciations older than the Younger Dryas in the Lake District. Periods of ice sheet inundation, whilst dramatic, were relatively short-lived. Instead, average glacial conditions were likely characterized by mountain icefield systems as well as smaller cirque and valley glaciers. Such periods of restricted glaciation played a key role in the development of the classic landforms and landscapes of glacial erosion for which the Lake District is well known (see chapter 3, this guide). Depositional evidence for pre-Younger Dryas mountain glaciation in the Lake District exists, but it has not yet been systematically investigated. A better understanding of the distribution of these moraines may in turn allow Younger Dryas outlet glacier extents to be defined more accurately.

- **Dating glacial landforms.** Due to the difficulty and expense in obtaining absolute dates for glacial depositional landforms, moraine morphology has been widely employed as a relative dating technique in order to differentiate between Younger Dryas and older moraines. Specifically, Younger Dryas moraines are widely described in the literature as being prominent and sharply-defined ('fresh' looking), whereas older features are thought to be more subdued and rounded due to the effects of prolonged weathering and erosion. Ideally, this approach to dating should be combined with landsystem contrasts (e.g. river terrace sequences, periglacial landforms – see Lukas, 2006) but, as is the case for the Lake District, these are often poorly-developed or absent and so reliance is placed exclusively on moraine morphology. Unfortunately, it is becoming increasingly clear that moraine morphology is an unreliable relative dating technique (McDougall, 2013). The use of soil chronosequences, where soil development is employed as a relative age indicator, may provide a much better way of differentiating between Younger Dryas and older moraines (see chapters 3, 7, 14 and 15 – this guide). Cosmogenic isotope dating also has a role to play, as demonstrated by Wilson et al. (2013), but there remains some uncertainty about its effectiveness in the Lake District due to the potential for significant nuclide inheritance (as a result of short transport distances and resistant volcanic rocks).

D.A. McDougall and D.J.A. Evans

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